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Sensory acceptance of a non-dairy probiotic fermented drink with mesquite pod

Aceptación sensorial de una bebida fermentada probiótica no láctea con vaina de mezquite

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Abstarct

The world market of functional and / or nutraceutical beverages is a growing health conscious food industry Because Consumers demand Foods That Improve well-being, reduces the risk of diseases and also, free of the animal proteins (vegans). Mesquite pod extract (legume) can be incorporated into non-dairy beverages as a source of antioxidants and add probiotic cultures for fermentation. The aim was Formulated to functional beverage With Lactobacillus acidophilus CDBB 1041 (20%) isolated from Tepache and Identified by PCR, aqueous extract of Prosopis glandulosa seed (500 mg / mL) (15%), agave honey (15%) and fermented at 42 oC / 72 hours in microaerobic. Bacterial growth (optical density 600 nm), pH, glucose, ªBrix, antioxidant capacity and sensory acceptance Were determined. Were Obtained beverages plus nut, mint or coconut flavor (3%) With 8.

Fermented Beverages, Antioxidants, Prosopis

Resumen

El mercado mundial de bebidas funcionales y/o nutracéuticas es un sector alimentario en crecimiento pues los consumidores conscientes de la salud exigen alimentos que mejoren el bienestar, reduzcan el riesgo de enfermedades y además, libres de proteínas animales (veganos). El extracto de vaina de mesquite (leguminosa) puede incorporarse en bebidas femrentadas no lácteas como fuente de antioxidantes y adicionar cultivos probióticos para la fermentación. El objetivo fue formular una bebida funcional con *Lactobacillus acidophilus* CDBB 1041 (20%) aislado de Tepache e identificado por PCR, extracto acuoso de semilla de *Prosopis glandulosa* (500 mg/mL) (15%), miel de agave (15%) y se fermentó a 42 ºC/72 horas en microaerobiosis. Se determinaron el crecimiento bacteriano (densidad óptica (600) nm), pH, glucosa (g.L-1), ªBrix, capacidad antioxidante (%) y aceptación sensorial. La bebida mostró amargor y se adicionó saborizante de nuez menta o de coco (3%), obteniendo un producto final con 8.5 x 10^7 cel/mL de *L. acidophilus*, pH 5.4 a 5,5, glucosa de 10.29 a 19.53 gL^{-1}, 6.6 a 7.6 ºBx y capacidad antioxidante de 42.26 a 49.41 %). La aceptación sensorial de los consumidores fue moderada y se diseñaran nuevas formulaciones para proveer una alternativa funcional con efectos beneficios para la salud humana, proporcionados por el cultivo probiótico y los antioxidantes de mezquite.

Bebidas Fermentadas, Antioxidantes, *Prosopis*

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Introduction

In the last decade, the demand for food and "healthy" drinks has increased in many parts of the world and spreading throughout the functional foods market has changed differentiation between pharmacy and nutrition (Eussen et al., 2011). This leads consumers to the constant search for products that provide improved health, and recognition of the key role of food and beverages in the prevention and treatment of various diseases (Corbo et al., 2014). In the categories of functional foods include drinks by high demand primarily because of easy to incorporate into various formulations nutrients and bioactive compounds (Wootton and Ryan-Beard 2011).

Nondairy fermented beverages are a very important class based beverages juice and / or fruit extracts and vegetable (juices, purees, pulps, juices, extracts, pieces or powder), cereals, legumes, sprouts and also with added probiotic cultures (Ranadheera et al, 2017;.. Marsh et al, 2014), and the main genres indicated as sources of probiotics are Lactobacillus and Bifidobacterium (Gawkowski and Chikindas 2013) that can be isolated from traditional fermented beverages as tuba and Mexican tepache (De la Fuente-Salcido, et al 2015).

Probiotic drinks are classified as dairy and non-dairy (Vijaya Kumar et al.,2015), and it is important to mention that there is an increasing demand for formulations without milk in order to reduce health risks, mainly lactose intolerance, diseases caused by high fat and cholesterol content in standard products, various allergies due to milk proteins (atopic dermatitis) and prevent diseases associated with a high intake of animal proteins such as obesity andthe Oxidative stress (Ricci et al., 2006; Gu and Xu et al, 2010;. Tang et al, 2018.). This has resulted in the development of non-milk fermented beverages, it has been strongly driven by the increasing number of people withto avoid consume animal products (vegans), and is expected to market sales of soft drinks Fermented exceed $ 2.5 billion by the end of 2025 (https://www.plantbasednews.org).

With respect to antioxidants, these plant secondary metabolites have become one preferred by people who want to preserve health through the consumption of beverages containing high concentrations of phenolic compounds possessing anticancer activity ingredient (Roleira et al., 2015), as shown by epidemiological studies of populations with a diet rich in fruits and vegetables (herbs and spices) with high content of phenols and therefore, high potential biopharmaceutical (Sepahpour et al, 2018;. Henciya et al, 2017; Wang et al, 2013;. Kushi et al, 2012.).

In this context, the idea was generated to develop a fermented non-dairy beverage using functional probiotic Lactobacillus acidophilus, agave nectar and fermentable substrate and seed extract glandulosa Prosopis (mesquite) as a source of antioxidant compounds. Therefore, the main objective was to evaluate the sensory acceptance of mesquite functional drink with regular users of non-milk fermented products.

Materials and methods

Isolation and identification of probiotic culture. Lactic acid bacteria tepache (fermented beverage mexicana) was isolated by serial dilutions (10 -1 to 10 -6) And plated on MRS agar (BL Bioxon) Incubated at 42oC / 48 h under aerobic and anaerobic conditions (aerobic and anaerobic conditions (BD GasPak EZ Anaerobe Container System). The genus and species of the strain was determined preliminarily with system API 50 CH (API systems, BioMéreux) (Source-Salcido, et al 2015 and later by amplification with the polymerase chain reaction (PCR) of the 16S rDNA region with universal oligonucleotides 3'UBF5- AGAGTTTGATCCTGGCTGAG- (direct) and 1492 R5- reverse GGTTACCTTGTTACGACTT- 3 . (. Leon-Galvan et al 2009) DNA amplification with high fidelity polymerase (BioRad) was performed at 5 min at 95 ° C; 30 cicles of 30 sec 95 ° C, 30 s at 55 ° C, and 1:40 min at 68 ° C and final 5 min keeping at 72 ° C. Lactobacillus acidophilus strain collection CDBB 1041 Micro 500 CDBB CINVESTAV Mexico was used, DF

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Obtaining extract Mezquite

The entire pod (pod and seed) dehydrated (7 days / 70 ° C) of Prosopis glandulosa Coahuila (pulverisette 2) was milled, the flour diluted in water and decoction (95 ° C / 3 min) an extract was obtained (500 mg / mL) was filtraró with Whatman, centrifuged and sterilized by filtration (0.45 .mu.m Millipore). the amount of phenols was quantified in extract (1 mL) byCiocalteu method Foling-using gallic acid as a standard (Balderas et al., 2017).

Batch fermentation process probiotic drink.

Fermentation was carried out for 72 h 42ªC stirring at 150 rpm in triplicate, using a formulation mesquite extract (500mg / mL) added with 20% lactic culture (L. acidophilus) and 15% agave syrup as fermentable substrate.

During the time course of the fermentation the optical density of the culture at 600 nm by espectrofotmetría (CECIL), the pH, the amount of glucose (g L-1) by the validated method of 3,5-dinitrosalicylic acid (DNS) were monitored (Canseco et al, 2015.) and antioxidant capacity by elimination of DPPH radical (2,2-diphenyl-1-picryl hidrazilo) (Ramadan et al., 2003; Clarke et al, 2013;. Les et al, 2015.).

Sensory evaluation of the functional beverage.

The functional beverage was added with nuts, coconut mint (3%) and subjected to sensory evaluation by judges not trained (> 30) using a hedonic scale of nine points and responses analysis of simple variance (ANOVA) using the program STATGRAPHICS Version 5.

Results

Isolation and identification of probiotic culture
The obtained PCR amplicon sequenced National Laboratory Genomics for Biodiversity (Langebio), CINVESTAV Irapuato was analyzed in BLAST (Basic Local Alignment Search Tool) program providing 99% identity with L. acidophilus.

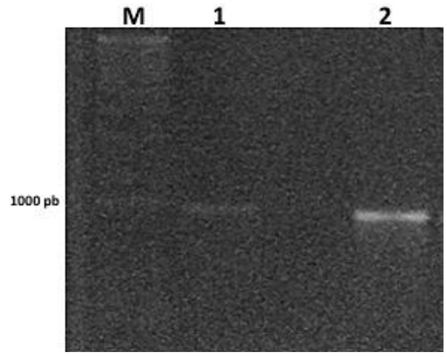

Figure 1. PCR amplification of 16S rDNA region of strain identified as Lactobacillus acidophilus preliminarily isolated Tepache (agarose gels stained with 1% GelRed□Biotium) Lane M, marker 1 Kb (Invitrogen); Lane 2 positive control amplicon L. acidophilus CDBB 1041; Lane 3 amplicon L. acidophilus isolated from tepache.

Mezquite extract

It has reported the large biopharmaceutical potential mesquite because components as flavonoids, tannins, alkaloids, quinones or phenolic compounds demonstrate potential in biological functions (analgesic, anthelmintic, antibiotic, antiemetic, microbial antioxidant, antimalarial, anticoccidial, oral disinfectant, plus probiotics and nutritional effects (Henciya, et al., 2017). The proportion of polyphenols obtained for P. glandulosa (Table 1) confriman antioxidant potential to use the extract as functional / nutraceutical ingredient functional beverage.

Abstract		Phenols (gL-1)
Sheet		179.58 + 0.37
Sheath		51.89 + 0.29
Seed		42.32 + 0.85
Carozo		35.22 + 0.20

Table 1 Determination of phenols extracts P. glandulosa

It has been reported that polyphenolic compounds show high antioxidant activity Prosopis (Henciya, et al., 2017) with an elimination of 60.48 and 47.82 radicals%, for P. juliflora and P. cineraria respectively, values very close to those obtained in this study, values which may be dose dependent (Siahpoosh and Mehrpeyma 2014; Napar et al, 2012.).

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Fermentation Process

Figure 2 shows the time course of fermentation of a batch of functional beverage monitored for 72 h is shown. The drink was formulated with mesquite extract (500mg / ml) supplemented with L. acidophilus (20%) and agave syrup (15%).

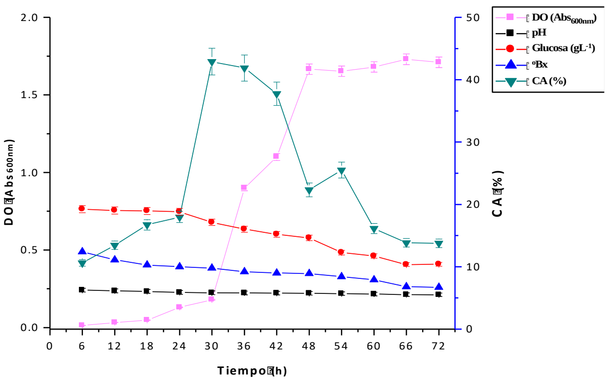

Figure 2 Time course of fermentation of functional beverage 72 h monitored by determining optical density (OD), pH, glucose (g L-1), oBrix and antioxidant capacity (CA%)

In determination glucose drinks 1, 2 and 3 minimal degradation (19.24 to 10.37, 19.53 to 10.16 and 19.39 to 10.29 gL-1) was observed, and it would be important to modify the carbohydrate source (agave syrup) and / or its percentage, likewise find a source of sugars that promotes growth of probiotic culture (L. acidophilus) that reached very low optical density (1.71, 1.94 and 1.74). PH values drinks were acidic (5.5, 5.5 and 5.4) and then provided the bitter so it was decided to add flavorings of nut, mint and coconut (3%) at the end product before sensory evaluation.

Regarding the antiradical action towards DPPH the obtained value was only slightly lower (42.91, 42.26 and 49.41%) than other antioxidant drinks, such as drinks, and definitely showed a wide, slightly lower than the tea antioxidant capacity lemon, green tea, black tea, soluble coffee (Altamirano, 2013). Also, it has developed a beverage, named "anapa" mixing mesquite pods in water and then fermented alcoholic beverage produced "chichi" (Vilela et al., 2009).

Tiempo (h)	Bebida 1					Bebida 2					Bebida 3				
	DO 600 nm	pH	Glucosa (g.L-1)	°Brix	CA (%)	DO 600 nm	pH	Glucosa (g.L-1)	°Brix	CA (%)	DO 600 nm	pH	Glucosa (g.L-1)	°Brix	CA (%)
0	0.014	6.2	19.24	12.4	10.62	0.06	6.2	19.53	13	10.27	0.05	6.2	19.39	12.6	9.54
6	0.033	6.1	19.03	11.1	13.44	0.08	6.2	19.35	12	10.89	0.09	6.2	19.10	12.5	12.24
12	0.048	6.0	18.95	10.3	16.73	0.09	6.0	19.28	10.6	15.33	0.059	6.0	19.00	10.2	19.27
18	0.13	5.8	18.81	10	17.98	0.15	5.8	18.98	10.5	16.20	0.57	5.8	18.95	10.1	21.11
24	0.18	5.8	17.12	9.8	42.91	0.21	5.8	18.14	9.6	39.94	0.99	5.7	18.06	9.6	49.41
30	0.9	5.8	16.02	9.2	11.88	0.99	5.9	17.45	9.0	42.26	1.0	5.8	17.77	9.5	46.26
36	1.1	5.7	15.20	9.0	17.75	1.3	5.7	16.10	9.0	28.06	1.22	5.7	16.70	9.6	36.72
42	1.666	5.7	14.63	8.9	12.33	1.78	5.7	15.64	9.0	23.93	1.65	5.8	15.91	9.5	31.66
48	1.653	5.7	12.27	8.4	25.50	1.80	5.7	13.88	8.6	24.94	1.68	5.8	14.72	9.1	28.43
54	1.68	5.6	11.71	7.9	16.14	1.83	5.6	12.45	8.0	17.76	1.7	5.6	13.88	8.7	22.28
60	1.73	5.5	10.35	6.8	13.84	1.85	5.5	11.81	7.8	14.01	1.70	5.6	11.93	8.3	19.71
66	1.71	5.5	10,40	6.7	13.77	1.89	5.4	10.57	7.5	12.55	1.74	5.4	10.71	7.9	15.44
72	1.71	5.5	10.37	6.6	13.77	1.94	5.5	10.16	7.5	12.18	1.74	5.4	10.29	7.6	14.93

Table 2 Parameters determined during fermentation of functional beverage

Sensory evaluation.

Drinks obtained had a dark appearance and taste perceived bitter, and before sensory evaluation flavors nuttiness (1), mint (2) and coconut (3) were added. In Figure 3 the analysis of variance parameters acidity, sweetness, astringency, aftertaste, salt, color, transparency, and precipitation can be observed.

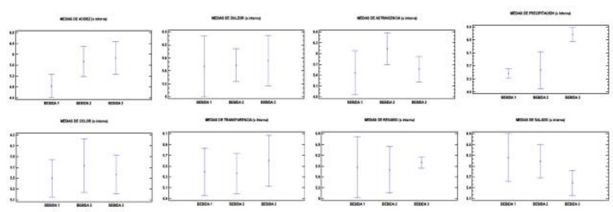

Figure 3 Results of sensory evaluation nondairy fermented beverages nut (1), mint (2) and coconut (3) made with mesquite pod extract, agave nectar and probiotic culture (L. acidophilus)

Medium scale acceptance provided for mint and coconut flavors, and nutty flavor drink showed greater acceptance by judges who tasted samples.

With respect to the above other beverages are formulated currently modifying extract concentrations and source of sugars in order to increase consumer acceptance.

Conclusions

This work provides powerful and useful information about the antioxidant activities mesquite both the extract and the formula of the functional beverage. A pop variety of nondairy fermented drinks containing probiotics and extract mesquite, whose purpose is to provide an alternative way desirable to improve and / or maintain health of ordinary consumers of these food products are developed.

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